

Invited article

Plant Inventory Research: Contributions to the Flora of Myanmar

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The Makino Botanical Garden and its associated institutions have been conducting plant inventory research for contributions to the Flora of Myanmar, based on a memorandum of understanding signed by Makino and the Forest Department, Ministry of Forestry of Myanmar. Current our inventory field research of Myanmar is presented here. Field studies have focused on 2 sites, Mt. Popa and Natma Taung (Mt. Victoria) National Park. Checklists to the flowering plants of these two mountains are currently being prepared respectively based on the collections we have amassed so far. We have also organized training programs to help build capacity amongst our counterparts in Myanmar. For the continued success of collaborative floristic work in Myanmar, a local research centre is required to serve as a herbarium and to promote education on issues such as taxonomic botany.

Key words: inventory, flora of Myanmar, Mt. Popa, Natma Taung National Park, Mt. Victoria.

Myanmar (Burma) is located south of the Himalayan region and, with a land area of 676,500 km² (approximately twice the size of Japan), spans tropical evergreen, mixed deciduous, savanna and alpine vegetation types. With its wealth of plant diversity, Myanmar is one of the most botanically fascinating countries in the world. Since British botanists such as F. Kingdon-Ward, J. H. Lace, R. E. Cooper and others made botanical surveys in the country over half a century ago (Table 1), no comprehensive floristic surveys have been conducted, and much remains to be learnt of its flora as well as of its floristic relations with neighbouring regions in Asia. Thus far, ca. 11,800 species of spermatophyte

have been reported from Myanmar (Kress *et al.* 2003) though many more are likely to exist.

At present, the Makino Botanical Garden and its associated institutions are conducting plant inventory research in conservation areas for contributions to the Flora of Myanmar, based on a memorandum of understanding signed by Makino and the Forest Department, Ministry of Forestry of Myanmar. Thus far ca. 6,500 specimens have been collected in Mt. Popa, Mandalay Division and Natma Taung National Park, Chin State.

Methodology of inventory research

This article is formed from the presentation as one of contributions for the International Symposium 2004, Asian Plant Diversity and Systematics, held at Sakura, Chiba, Japan on July 29 - August 2, 2004.

TABLE 1. Key plant collections in Myanmar (Burma) in 20th century. Based on data from herbarium specimens deposited in A, E and also MacLean (1997, 2004).

Year	Locality	Collector
1908	Upper Chindwin	J. H. Lace
1910	Myitkyina	I. M. Buchanan
1910	Maymyo	J. H. Lace
1911	Mt. Victoria	Charlotte Wheeler Cuffe
1911-1912	Myitkyina, Mandalay, Mogo	J. H. Lace
1912	Upper Burma	Gorge Forrest
1914	April exp. to Burma	Frank Kingdon-Ward
1914	Myingyan District	C. Gilbert Rogers
1914	Upper Burma	Gorge Forrest
1916	Chin Hills	V. H. T. Fields Clarke
1919	North Burma	Frank Kingdon-Ward
1919	North Burma & Assam	Reginald Farrer
1919	Myitkyina District	C. Gilbert Rogers
1922	Southeastern Shan State	J. F. Rock
1924	Mt. Victoria	R. E. Cooper
1924	Tavoy (Tenasserim)	R. N. Parker
1924-1925	Upper Burma	Gorge Forrest
1926	North Burma and Assam	Frank Kingdon-Ward
1926	Mt. Victoria	R. Unwin
1929	Burma and Indochina	Frank Kingdon-Ward
1930-1931	North Burma	Frank Kingdon-Ward
1931-1932	Rangoon, Maymyo	F. G. Dickason
1932	Rangoon	C. E. Parkinson
1935-1939	Webula, Mt. Popa, Mt. Victoria , Taunggyi	F. G. Dickason
1937-1938	North Burma, Assam and Tibet	Frank Kingdon-Ward
1952-1953	North Burma	Frank Kingdon-Ward
1956	West central Burma, Chin hills, Mt. Victoria	Frank Kingdon-Ward
1961-1962	Kachin State, Tenasserim	J. Keenan et al.
1961-1962	Maymyo	A. L. & M. P. Bogle

The Forest Department of Myanmar currently manages 38 parks for the protection of wildlife. These 38 parks consist of: six National Parks (Hkhakabo Razi, Alaungdaw Kathapa, Natma Taung, Lampi, Taninthary and Lenya), 27 Wildlife Sanctuaries, two parks, two protected areas and one elephant range. Levels of biodiversity are high in all of these parks, though especially in the National Parks. Taninthary and Lenya are established in 2002.

Our strategy in compiling a full flora of Myanmar is to first draw up individual inventories for each of the National Parks, Wildlife Sanctuaries and Mountain Parks managed by the Forest

Department in particular, pre-selected regions. We aim to complete checklists at two or three sites simultaneously in any one region, and thereby undertake floristic analyses for that region as a whole. Currently, our field studies are focusing on two sites in central and western Myanmar: Mt. Popa in Mandalay Division, and Mt. Victoria in Chin State.

A total of ten expeditions have been conducted in those two sites with the cooperation of Botanical Gardens, the University of Tokyo (Table 2) and thus far collected ca. 6,500 specimens. One set of the specimens is kept at the Forest Department

of Myanmar, and remaining sets were sent to MBK and TI. Checklists to the flowering plants of Mt. Popa and Mt. Victoria are currently being prepared based on the collections we have amassed so far and specimens that are housed in A and E.

In addition, local botanists from the Myanmar Forest Department have been invited to Japan to broaden their knowledge of taxonomy and herbarium management.

Study sites

We chose Mt. Popa (25°56'N, 55°16'E) as our first study site in Myanmar because it is an isolated mountain, and an extinct volcano in Myanmar, surrounded by dry zone savannah. As such, it is likely to have a unique flora including endemic taxa. It is quite easy to access Mt. Popa from Bagan, as well as from Mandalay. Furthermore, Popa Mountain Park already has an active Environmental Education Centre, which we have been able to use to prepare herbarium specimens. Initially, it was necessary to highlight to the local Forest Department staff the importance of floristic research as well as to clarify our aims in working in the area.

Dickason is probably the first botanist who made a botanical collection in Mt. Popa. He visited many places in Myanmar (Table 1) and made a phylogenetic study of the ferns of Myanmar

(Dickason 1946), however, he didn't make any account on Mt. Popa.

The vegetation of Popa is tropical deciduous forest, however, moist forest can be seen around 1000 m above sea level. In tropical deciduous forest, *Dipterocarpus*, *Shorea*, *Terminalia*, *Lagerstroemia* are common trees. *Balanophora abbreviata* Bl., and some aroids such as *Arisaema*, *Typhonium*, *Amorphophallus*, gingers such as *Curcuma*, *Hedychium*, *Zingiber*, terrestrial orchids, *Cymbidium*, *Habenaria*, *Pecteilis*, *Spathoglottis* etc. exist at the edge of the forest. The vegetation around the peak is grassland, in which *Anaphalis*, *Echinops* are growing. *Drosera peltata* Smith has been also found around the peak (1518 m).

Yin-Yin-Kyi (1992) identified 74 species of flowering plants in her preliminary reports on vegetation of Mt. Popa and she made a survey of crater's vegetation and 221 species were enumerated (Yin-Yin-Kyi 1997). Checklisting of flowering plants of Mt. Popa have been currently prepared and we also intend to make a joint publication of a field guide to flowering plants of Mt. Popa with the Smithsonian Institutions (Kress pers. comm.). It is estimated more than 300 species in Mt. Popa.

The Natma Taung National Park, another study site, is located in the southwestern part of Myanmar, in so-called "Chin Hills". Mt. Victoria (21°12'N, 93°35'E) is the highest mountain in this range (Fig. 1).

TABLE 2. Botanical surveys to Myanmar conducted by the Makino Botanical Garden and Botanical Gardens, the University of Tokyo from 2000 to 2004.

Year (month)	Locality
2000 (June)	Popa Mountain Park & Maymyo
2000 (October)	Popa Mountain Park
2001 (July)	Popa Mountain Park & Maymyo
2002 (January)	Popa Mountain Park & Maymyo
2002 (March)	Popa Mountain Park & Mt. Victoria
2002 (June)	Mt. Victoria
2002 (December)	Mt. Victoria & Mindat
2003 (April)	Popa Mountain Park & Mt. Victoria, Mindat
2004 (February to March)	Mt. Victoria
2004 (May)	North of Natma Taung (Mt. Victoria) N. P.

To the north, the Chin Hills connect with a taller mountain range of which Mt. Hkhakabo Razi is the most famous peak. Mt. Victoria is regarded as an ecological refuge, offering a temperate climate that is absent from neighbouring regions. It is estimated that there are about 2500 vascular plant species in Chin Hills (Mill 1995). Indeed, a number of endemic and relict species are found in this area such as *Potentilla montisvictoriae* H. Ikeda & H. Ohba and *Rhododendron cuffeanum* Craib ex Hutch.

Several collections have been made in Mt. Victoria National Park by Charlotte Wheeler Cuffe in 1911 (National Botanic Gardens, Glasnevin 1995), Cooper in 1924, Unwin in 1926, Dickason in 1937 and Kingdon-Ward in 1956 (Table 1). Kingdon-Ward (1958) published an article on the vegetation of Mt. Victoria. A local botanist, Myo-Khin (2000), made surveys in Natma Taung

National Park and enumerated 193 species of flowering plants in his preliminary checklist. Unfortunately he passed away after that when he was still young.

Six types of vegetation can be recognized in Mt. Victoria. They are; tropical deciduous dry forest, mixed evergreen broadleaved forest, fire preclimax Pine savanna, temperate semi-evergreen forest and subalpine meadows (Kingdon-Ward 1958, Mill 1995). A lot of epiphytes are growing on trees in temperate evergreen forest in Mt. Victoria (Fig. 2). Himalayan ginger, *Roscoeia alpina* Royle, three species of *Anemone*, *A. obtusiloba* D. Don, *A. rivularis* Buch.-Ham. ex DC., *A. rupestris* Hook. f. ex Thoms. are found in alpine meadow around the peak (ca. 3050 m) (Figs. 3, 4). Numerous orchids such as *Dendrobium*, *Coelogyne*, *Papilionanthe*, *Renanthera* etc., and also various gingers such as

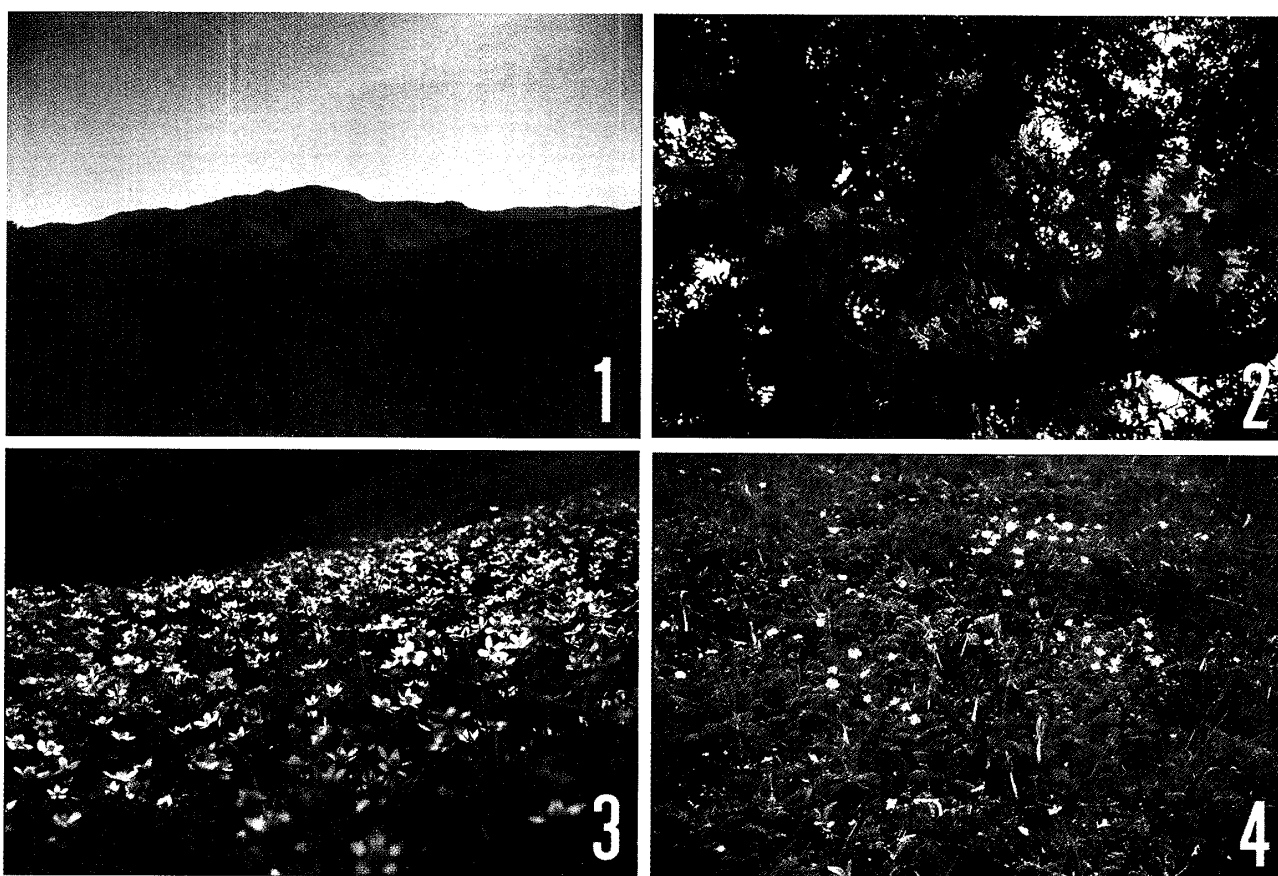


FIG. 1-4. 1: Scenery of Mt. Victoria and Natma Taung National Park. 2: Epiphytic *Coelogyne nitida* Lindl. and *Aeschynanthus* sp. on trees in evergreen temperate forest, Natma Taung National Park. 3: Alpine meadow dominated by *Anemone obtusiloba* D. Don near the peak of Mt. Victoria. 4: *Roscoeia alpina* Royle and *Potentilla montisvictoriae* H. Ikeda & H. Ohba in alpine meadow around the peak.

Zingiber, *Curcuma*, *Hedychium*, *Globba*, *Rhynchanthus* etc. can be observed in this park. An epiphytic rhododendron, *R. cufteanum* Craib ex Hutch. is very common around Mt. Mow Bi in the north of the National Park.

A checklist of mosses was published by Tanaka *et al.* (2003) and recognized 152 species from Mt. Victoria and 53 species were newly recorded from Myanmar. Thus far several new species of flowering plants have been recognized by these botanical inventories. Checklists to the flowering plants of these two mountains are currently being prepared respectively based on the collections we have amassed so far.

Discussion

The biggest problem in conducting expeditions in Myanmar is the intensity of rainfall, which is particularly affected by monsoons during the rainy season. Once the rainy season starts, muddy roads and landslides make movement difficult, and access to certain National Parks, such as Natma Taung and Alaungdaw Kathapa as well as most areas in mountainous regions, is often impossible. Even off-road cars cannot cope with the difficult conditions. The rainy season in Myanmar begins from mid-May and continues until the end of October - that is, almost half a year. The situation has been particularly problematic in our second study site, Natma Taung National Park. For this reason, we trained the park rangers there to collect and process herbarium specimens and to make appropriate field notes and records by themselves, such that local personnel can now conduct botanical surveys in our absence throughout the rainy season.

There is a botanical garden at Maymyo, at an altitude of 1000 m, which was established under British rule. Because of the cool weather, this garden is suitable for growing plants from higher elevation such as Chin Hills and Upper Myanmar. If we support the development of this garden, it too could

become a centre for inventory research as part of the overall project.

We at the Makino Botanical Garden believe that a herbarium, as a plant inventory research centre for the flora of Myanmar, is necessary for this project and we are trying to get a grant to build a herbarium building at the Forest Department Office in Yangon. For ongoing, long-term research, we propose to select appropriate persons based at each conservation area respectively, and then train them in botanical collecting. They would then collect specimens in their area and send them onto the Yangon herbarium.

Although there are a relatively large number of well-trained foresters and forestry officials in Myanmar, there are presently few professional botanists. In order to further efforts in floristic research, as well as to contribute to the development of human resources in Myanmar in general, it is necessary for Japan and other developed countries to provide international assistance in this respect. Part of our programme in Myanmar involves cooperation with our partner institutes to help promote the development of human resources.

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